

Application No. 09/883,833
Response to Office Action

Customer No. 01933

R E M A R K S

Reconsideration of this application, as amended, is respectfully requested.

ALLOWABLE SUBJECT MATTER

The Examiner's allowance of claims 10-12 and 20-22 and the Examiner's indication of the allowability of the subject matter of claims 8 and 19 are respectfully acknowledged.

THE TITLE

The title has been amended to more clearly indicate the nature of the invention to which the claims are directed, as required by the Examiner.

THE CLAIMS

New claims 29 and 30 have been added based on the subject matter of (now canceled) claims 1 and 16, respectively.

In addition, claims 13 and 23 have been amended to incorporate the subject matter of (now canceled) claims 14 and 24, respectively.

Still further, claims 10, 13, 15, 20, 23 and 25 have been amended only to make some minor grammatical improvements and to correct minor antecedent basis problems so as to put them in better form for issuance in a U.S. patent.

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No new matter has been added, and no new issues with respect to patentability have been raised. Accordingly, it is respectfully requested that the amendments to claims 10, 13, 15, 20, 23 and 25 and the addition of claims 29 and 30 be approved and entered, and it is respectfully submitted that claims 10-12 and 20-22 remain in condition for allowance.

It is respectfully submitted, moreover, that the amendments to claims 10, 15, 20 and 25 are not related to patentability, and do not narrow the scope of the claims either literally or under the doctrine of equivalents.

THE PRIOR ART REJECTION

Claims 13, 15, 23 and 25 were rejected under 35 USC 102 as being anticipated by JP 2000-138862 ("Matsuda"); claims 14 and 24 were rejected under 35 USC 103 as being obvious in view of Matsuda; claims 1-4, 6, 7, 9 and 16-18 were rejected under 35 USC 103 as being obvious in view of the combination of Matsuda and USP 6,583,820 ("Hung"); and claim 5 was rejected under 35 USC 103 as being obvious in view of the combination of Matsuda, Hung and USP 6,141,047.

Re: New Independent Claims 29 and 30

According to the present invention as recited in new independent claims 29 (and corresponding method claim 30), an

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imaging apparatus is provided which comprises, in particular, converting means for converting the original image signal from the image pickup device to an output image signal in accordance with the designated one of first and second gradation modes, such that the original image signal is converted to the output image signal with a first gradation characteristic when the first gradation mode is designated, and such that the original image signal is converted to the output image signal with a second gradation characteristic when the second gradation mode is designated. In addition, the imaging apparatus comprises exposure controlling means for controlling an exposure level of the photographic subject image in accordance with the designated mode, such that the exposure level is controlled to a predetermined exposure level corresponding to a predetermined brightness level when the first gradation mode is designated, and such that the exposure level is controlled to the same predetermined exposure level corresponding to a brightness level different from the predetermined brightness level when the second gradation mode is designated.

That is, according to the present invention as recited in new independent claims 29 and 30, exposure control is carried out in accordance with the designated gradation mode, which may be arbitrarily selected by a user, so that the exposure value is always a predetermined value even if the predetermined brightness

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level of the subject of exposure control is different. Or, from a different point of view, according to the present invention even if the predetermined brightness level of the subject of exposure control is the same, exposure control is carried out so that the exposure value differs according to the selected gradation property.

Intentionally changing the gradation property generates an input and output property of a signal that is not uniform with respect to the entire subject including the main subject as shown in Fig. 2 of the present invention. That is, for example, if $\gamma=0.45$ is selected as an example gradation property, exposure control is carried out so that the predetermined exposure value is an input digital value 46 which corresponds to 18% of a maximum digital input value 255. In this case 46 is the appropriate exposure amount. The appropriate exposure amount ("A") is a specific amount corresponding to a specific subject, and for example, has an aperture of F4 and a shutter speed of 1/250. Of course, the value of the aperture and the shutter speed depends on the brightness of the subject, and is determined for each image. The value 18% corresponds to a standard reflectance rate of 18%, which is the target value of exposure control in pictures taken on silver-halide film. The light amount of the surface of the subject to be photographed is

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controlled to a predetermined exposure value when carrying out exposure control.

When the gradation property is changed to $\gamma=1$, for example, if the predetermined exposure value "A" is not changed, photography will be carried out using the same exposure (i.e., the same aperture and shutter speed). Even if the value of γ is changed, when the exposure amount is the same on the same surface of the subject, naturally, the same digital input value is be obtained. However, if the conversion property (the value of γ) of the digital input/output is different for the same digital input value, the digital output value cannot be the same value.

In more detail, if the value of γ is set to $\gamma=0.45$ and $\gamma=1$, and exposure control is carried out using the same exposure value, the digital input value will naturally be the same value. If digital conversion is then carried out with the different gradation properties $\gamma=0.45$ and $\gamma=1$, the digital output value of the digital input value 46 will be a desired value 104 when $\gamma=0.45$, but only a much smaller digital output value can be obtained when $\gamma=1$ and the digital input value is 46, as shown in Fig. 2 of the present application. The smaller digital output value obtained when $\gamma=1$ in this example corresponds to a reduced brightness of a reproduced image on a monitor or a printer relative to the brightness of the reproduced image when $\gamma=0.45$.

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According to the present invention as recited in claims 29 and 30, the problem of the different brightness values corresponding to the different gradation properties is solved by carrying out exposure control so that different exposure values can be obtained according to the gradation property when the gradation property is changed. Since the exposure value according to the present invention as recited in claims 29 and 30 is determined based on the selected gradation property (gradation mode), the exposure value for at least one of the modes is different from the standard reflectance rate 18%.

The standard reflectance rate of 18% is based on an empirical theory that in a general subject to be photographed, when the brightness distribution existing in a screen is calculated and averaged, if the reflectance rate of all subjects in the entire screen is set to 18%, the image of an appropriate brightness can be reproduced as a result. It is general common knowledge in the art of exposure control to use 18% as the subject of exposure control. And it is respectfully submitted that it would not be obvious in view of the prior art to vary the reflectance rate from 18%.

According to the present invention as recited in independent claims 29 and 30, the exposure control is carried out to obtain an exposure value corresponding to the selected gradation property (mode). Thus, as shown in Fig. 2, for example, when

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$\gamma=1$, the input digital value is 104, corresponding to a reflectance rate of 104/255, or about 41%.

As recognized by the Examiner, Matsuda discloses selecting a gradation property (mode). However, as acknowledged by the Examiner on page 4 of the Office Action, Matsuda does not disclose any correlation between the selected gradation property and exposure control. For this reason, the Examiner has cited Hung to supply the missing teaching of Matsuda.

It is respectfully submitted, however, that according to Hung, an image is obtained and luminance information is acquired from the image. Then, based on the luminance distribution of the image, an exposure amount and gradation characteristic are determined that are properly correlated to produce an image with the appropriate luminance with an improved signal-to-noise ratio.

That is, according to Hung, preliminary photographing is carried out, the distribution of luminance of the subject at that time is detected, and a brightness histogram is created. The exposure amount during the actual photographing is determined based on the contents of the luminance histogram which has been created ("step S12," described at column 6, lines 10-29).

Then, according to Hung, a luminance histogram is recreated based on the determined exposure amount ("step S13," described at column 6, lines 30-60). And according to Hung, the gradation characteristic is determined based on the state of brightness

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distribution in the recreated brightness histogram ("step S14," described at column 6, line 61 to column 7, line 13). As recognized by the Examiner, moreover, according to Hung the gradation characteristic and exposure amount may be correlated with each other based on a detected average luminance of the image "so that the calculated average luminance may be the standard luminance."

It is respectfully pointed out, however, that according to Hung, the exposure amount and gradation characteristic must be determined based on the luminance of a preliminary image.

By contrast, according to the claimed present invention as recited in new independent claims 29 and 30, the gradation mode is designated, and the exposure level of the subject image is controlled in accordance with the designated mode. That is, according to the present invention as recited in new independent claims 29 and 30, the gradation mode is freely selectable and the exposure control is performed based on the selected mode.

According to Hung, by contrast, the gradation characteristic is finally determined based on the luminance distribution in the subject image.

Thus, it is respectfully submitted that even if Matsuda and Hung were combinable in the manner suggested by the Examiner, the combination thereof still would not achieve or render obvious the features of the present invention as recited in new independent

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claims 29 and 30 whereby one of a first gradation mode and a second gradation mode is designated, and whereby an exposure level of the subject image is controlled in accordance with the designated mode, such that the exposure level is controlled to a predetermined exposure level corresponding to a predetermined brightness level when the first gradation mode is designated, and such that the exposure level is controlled to the same predetermined exposure level corresponding to a brightness level different from the predetermined brightness level when the second gradation mode is designated.

Accordingly, it is respectfully submitted that the present invention as recited in new independent claims 29 and 30 clearly patentably distinguishes over Matsuda and Hung, under 35 USC 103.

Re: Amended Independent Claims 13 and 23

On page 7 of the Office Action, the Examiner asserts (without objective support) that the feature of the present invention whereby the first, second and third gradation property curves intersect one another at a substantially same intersection point, which is determined to correspond to 18 to 20% of a maximum signal level in a value on an input side of a gradation converting property (previously recited in claims 14 and 24, and now recited in amended independent claims 13 and 23) would have been an obvious modification of Matsuda.

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It is respectfully submitted, however, that the positioning of the intersection point of the gradation property curves is a critical feature of the present invention as recited in amended independent claims 13 and 23, which allows the above-described problem of different output values being caused by changing gradation properties to be solved without changing the exposure control in accordance with the gradation property.

It is respectfully submitted that this advantageous feature of the present invention can only be achieved if all three gradation property curves intersect at an intersection point. And it is respectfully submitted that a coincidental intersection of three curves is insufficient to achieve the above-described advantage of amended claims 13 and 23. Rather, according to the present invention as recited in independent claims 13 and 23 to achieve the above-described advantageous effect, the intersection point is determined to correspond to 18 to 20% of a maximum signal level in a value on an input side of a gradation converting property.

It is respectfully submitted that Matsuda does not disclose, teach or even remotely suggest the features of the present invention as recited in amended independent claims 13 and 23, whereby all three curves intersect at a substantially same intersection point, and whereby the intersection point is determined to correspond to 18 to 20% of a maximum signal level in a value on an input side of a gradation converting property.

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Accordingly, it is respectfully submitted that the present invention as recited in amended independent claims 13 and 23, and claims 15 and 25 respectively depending therefrom, clearly patentably distinguishes over Matsuda, under 35 USC 102 as well as under 35 USC 103.

* * * * *

In view of the foregoing, it is respectfully submitted that amended independent claims 13 and 23, claims 15 and 25 depending therefrom, and new independent claims 29 and 30, all clearly patentably distinguish over the cited references, taken singly or in any combination, under 35 USC 102 as well as under 35 USC 103, along with allowed claims 10-12 and 20-22.

Entry of this Amendment, allowance of the claims and the passing of this application to issue are respectfully solicited.

If the Examiner has any comments, questions, objections or recommendations, the Examiner is invited to telephone the undersigned for prompt action.

Respectfully submitted,

/Douglas Holtz/

Douglas Holtz
Reg. No. 33,902

Frishauf, Holtz, Goodman & Chick, P.C.
220 Fifth Avenue - 16th Floor
New York, NY 10001-7708
Tel. No. (212) 319-4900
DH:iv
encs.